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ABSTRACT

As part of Project IMPACT's effort to identify and develop procedures for complying with the impact requirements of Public Law 94-482, a field study was conducted to identify and validate variables and their order of importance in predicting and evaluating impact of research and development (R&D) projects in vocational and technical education. Another purpose of the study was to suggest an "Impact Rating Scale" for predicting impact of such projects. Impact variables for research, development, or R&D projects were identified by reviewing literature on the evaluation and impact of education projects and scientific innovations. Two major sets of variables (processes and effects) were identified for each category of projects. On the basis of this, predictive and evaluative impact variables were determined, and variables were ordered to propose an Impact Rating Scale. The five highest rated predictive impact variables were found to be quality of project product and use; quality of planning; quality of staff; market demand; and effects of project on teaching-learning procedures. The five highest rated evaluative impact variables were quality of product and use; effects of project on teaching-learning procedures; market demand for project product; effects of project on improvement of teacher quality; and effects of project on meeting vocational needs of special groups. Implications for further research include feasibility of fixing criteria for rating project proposals for making funding decisions. (KC)

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DEVELOPMENT OF PROCEDURES FOR ASSESSING THE IMPACT OF VOCATIONAL EDUCATION RESEARCH AND DEVELOPMENT ON VOCATIONAL EDUCATION (PROJECT IMPACT)

Volume 8 - A Field Study of Predicting Impact of Research and Development Projects in Vocational and Technical Education

STATE BOARD OF EDUCATION
Donald F. Muirheid, Chairman

ILLINOIS OFFICE OF EDUCATION
Joesph M. Cronin, State Superintendent of Education

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Development of Procedures for Assessing the Impact of Vocational Education Research and Development on Vocational Education (PROJECT IMPACT)

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August, 1980

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Abstract

In order to identify and develop procedures for complying with the impact requirements of Public Law 94-482, PROJECT IMPACT studied five problems: (1) how to define impact, (2) how to assess impact, (3) how to show cause and effect relationships between research and development (R&D) activities and changes in the vocational education teaching-learning situation, (4) how to predict the probability of impact, and (5) how to facilitate the impact of R & D activities. The methods used in these studies were to review and discuss views of experts and literature related to the problems and to analyse the process of impact in selected cases of R & D activities and exemplary programs in vocational education in Illinois. Findings of PROJECT IMPACT's activities from August 1, 1978 to July 1, 1980 are reported in nine volumes: (1) Context and Principles of Assessing Impact, (2) A Case Study of the Illinois Occupational Curriculum Project, (3) A Case Study of the Illinois Network of Exemplary Occupational Programs for Handicapped and Disadvantaged Students, (4) A Case Study of Illinois Projects in Horticulture, (5) A Case Study of Illinois Career Education Projects at the Awareness Level, (6) A Case Study of the Occupational Survival Skills Project, (7) Case Studies of Two Illinois School Districts with Innovative Vocational Education Programs, (8) A Field Study of Predicting Impact of Research and Development Projects in Vocational and Technical Education, and (9) an Executive Summary.

Volume 8 points out that funding agencies are faced with the problem of how to select from proposed projects those that would have relatively high impact if funded, as well as how to collect evidence of impact made by projects after they have been funded. The study identified and validated variables and their order of importance in predicting and evaluating R&D impact and suggested an "Impact Rating Scale" for judging proposals and projects.

PREDICTING IMPACT OF RESEARCH AND DEVELOPMENT PROJECTS IN VOCATIONAL AND TECHNICAL EDUCATION

BY

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M.E. (Hons.) University of Roorkee, 1970

THESIS

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in the Graduate College of the
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TABLE OF CONTENTS

CHAPTER		PAGE
1.	Introduction.	1
	Purpose of the Study.	4
	Objectives of the Study.	4
	Statement of Hypothesis.	5
	Assumptions and Limitations of the Study	5
2.	Review of Literature.	8
	Classification of Projects	8
	Definition of Impact	9
	Characteristics of High and Low Impact Projects. . . .	10
	Evaluating Impact of Projects.	13
	Predicting Impact of Projects.	19
3.	Methodology	28
	Classification of Vocational Education Projects. . . .	28
	Instrumentation, Data Collection and Analysis.	29
	Identification of Impact Variables	30
	Ranking and Weighting of Impact Variables.	30
	Instrumentation and Data Collection.	31
	Data Analysis	31
4.	Results	33
	Classification of Projects	33
	Identification of Impact Variables	35
	Predictive and Evaluative Impact Variables for Research and Development Projects in Vocational Education.	43
	Ranking and Weighting of Impact Variables.	47
	Weightings of Predictive Impact Variables.	52
	Proposed Criteria for Rating Proposals of Research and Development Projects on Predictive Impact Variables.	53
	Proposed Criteria for Rating Predictive Impact Variables of Research and Development Projects in Vocational Education	55
	Recommended Rating Scale for Predicting Impact of Research and Development Projects in Vocational Education.	63

TABLE OF CONTENTS (continued)

CHAPTER	PAGE
5. Summary and Implications For Further Research	66
Summary.	66
Implications For Further Research.	70
LIST OF REFERENCES	72
APPENDIX	75
Instruments	76

LIST OF TABLES

TABLE		PAGE
1.	Predictive Impact Statements (Tittle, Zibrin & Green, 1978).	24
2.	Percent Responses of Classifying Voc Ed Projects Into Categories of Research(R), Development(D) and Research and Development(R&D).	34
3.	Impact Variables for Voc Ed Research Projects	38
4.	Impact Variables for Voc Ed Development Projects.	40
5.	Predictive Impact Variables for Research and Development Projects in Vocational Education.	44
6.	Evaluative Impact Variables for Research and Development Projects in Vocational Education.	46
7.	Rankings of Predictive Impact Variables of Voc Ed R&D Projects.	48
8.	Rankings of Evaluative Impact Variables of Voc Ed R&D Projects.	50
9.	Computation of Weights of Predictive Impact Variables . .	54

LIST OF FIGURES

FIGURE		PAGE
1.	Potential Indicators of Change (National Center for Vocational Education Research, 1979).	18
2.	Evaluation Score Sheet (Ory, Harris, Dueitt & Clark, 1978)	20
3.	Impact Variables of Voc Ed Projects	36
4.	Predictive Impact Rating Scale for Research and Development Projects in Vocational Education.	64

CHAPTER 1

Introduction

In recent years it is very common to hear the word "impact" being used by politicians, administrators and the common man on the street whenever any new policy, project or innovative scheme is installed. This may be so because everybody - be it an individual taxpayer, public or private funding agency, is becoming more and more conscious of the optimal utilization of his/her investment.

Tracing historically, until 1963, most of the research and developmental activities relating to vocational education were conducted either in the form of unfunded dissertations or faculty initiated studies. Research and development did not become an official legislative element of vocational education until the 1963 Vocational Education Act was enacted into law (McCage, 1978). As a consequence of this, "the federal government began providing a substantial amount of money for research and development in curriculum development projects to gain clearer vision into processes of learning, instruction and curriculum development." Research Coordinating Units (RCU) were established in each of the states and became a permanent part of vocational education with the 1968 amendments of the 1963 Act. The activities of Research Coordinating Units include determining priority topics for research, development and dissemination; development of program budgets to meet these needs, soliciting, reviewing and funding of projects to carry out these programs; monitoring of the funded projects and introducing findings of these research and

development projects into the vocational education system. Establishment of RCU's with substantial amounts of funds gave a great impetus to research and development activities in vocational education. In 1974, United States Office of Education (USOE) asked the National Academy of Sciences (NAS) to assess the vocational education R&D programs conducted between 1965 and 1974, including research, exemplary programs and curriculum development efforts (National Academy of Sciences, 1976). The Committee of Vocational Education Research and Development (COVERD) study as it came to be known, took a comprehensive view of vocational education R&D and came out with a finding that the research and development projects studied had little evidence of R&D impact on students. The Rand corporation study (Pascal et al., 1975) contracted to evaluate the first round of career education exemplary programs supported by Part D funds from the 1968 vocational education amendments (PL 90-576) concluded that career education was not well defined and the projects did not make a continuing impact on students, project sites or other schools. Developmental Associates (1975) evaluated career education and also reported that residual impact upon students or school districts had been little. All these studies corroborated the findings of the COVERD study that vocational R&D of the past decade has not had documented widespread impact (COVERD, 1976). As a result of these reports, Congress passed the educational amendments of 1976 (Public Law 94-482) which mandated that contracts for R&D in vocational education would not be made unless the applicant could demonstrate a reasonable probability that the contract would result in improved teaching techniques or curriculum materials that

would be used in a substantial number of classrooms or other learning situations within five years after termination of such contracts (Federal Register, 1977). This implied that the proposal writers must include in their proposals intended impact of the proposed project as well as the evaluation scheme they would be using in the project. Funding agencies on the other hand, are very much concerned that the projects funded by them have the desired impact on the quality of education received by the students. They are thus faced with the problems of: a) selecting among the proposals of vocational R&D received for funding, those proposals that would have relatively more impact on the quality of education and b) collecting evidence of impact made by the projects funded by them by documenting information in respect of the changes occurring in the quality of vocational education and the effects on the targeted population due to the implementation of the projects. The first problem relates to predicting the impact of a proposed project and the second to the evaluation of impact of the completed project. Predicting as well as evaluating the impact of a research or development project are, however, among the most difficult problems in education. Limited efforts have been made to assess the impact of research, development and exemplary vocational education R&D projects in individual states (McCaslin, 1976). Even the studies that have been conducted in some of the states on evaluating impact of vocational education R&D projects report "lack of impact measures and impact data" (Evans et al., 1979). In these studies, impact has been measured most often in terms of user acceptance. The impact measures

have been subjective, difficult to measure, sometimes superficial and have failed to consider the long-term consequences of vocational education programs or R&D (COVERD, 1976). There is thus a need for developing methodology or models for evaluating impact of research and development projects in vocational education that may not only help in assessing, but also assist in predicting and facilitating the impact of R&D projects.

Whereas several studies have been conducted in evaluating impact of R&D projects in vocational education, very little work seems to have been done in developing a model for predicting impact of proposed R&D projects in vocational and technical education. Such a model will provide guidelines to the funding agencies in predicting probable impact of proposed projects and thus help in screening and selecting proposals for funding.

Purpose of the Study

The purpose of this study was to identify and validate variables and their order of importance in predicting and evaluating impact of research and development projects in vocational and technical education. Another purpose of the study was to suggest indices or criteria for assessing the above variables and propose an impact rating scale for predicting impact of "Research and Development" projects in vocational and technical education. The specific objectives of the study were outlined as follows:

Objectives of the Study

The specific objectives of the study were:

1. To classify different vocational education projects into specific categories for predicting and evaluating impact.

2. To identify different variables that influence impact of vocational education research and development projects.

3. To develop a set of impact statements of the variables, each for predicting and evaluating impact of vocational education research and development projects.

4. To validate and determine priority of impact variables for predicting and evaluating impact of vocational education research and development projects.

5. To determine weights of predictive impact variables of vocational education research and development projects.

6. To propose criteria for rating research and development projects on different predictive impact variables.

7. To propose a rating form for predicting impact of research and development projects.

Statement of Hypothesis

It was hypothesized that:

1. Projects in vocational education funded by DAVTE can be classified into categories of Research, Development and Research and Development for the purpose of studying impact and that there exists a strong agreement in classifying these projects by different people in Voc Ed.

2. There is no difference in the rank ordering of predictive and evaluative impact variables of "Research and Development" projects in Voc Ed by different groups of people in Voc Ed.

Assumptions and Limitations of the Study

Predicting and evaluating impact of research and development projects in education are highly complex problems. There are numerous factors (variables), some visible and others hidden that contribute to the impact of such a project. It is therefore likely, in such a study, to miss some of the variables that account for the impact. How important a variable is (as an outcome of R&D projects) is another issue on which individuals may differ, because of their differences in

perceptions, interests and affects. The constraints of time and resources are other factors that have limited the scope of this study. In short, the assumptions and limitations of the study are:

Assumptions

1. The impact of R&D projects in Voc Ed is influenced by two major sets of variables - the first relating to all those factors that go into making of the projects, e.g., quality of project team, project planning processes, etc., and the second relating to the effects of the project on the educational system and its environment. (Evans, 1979)

2. The variables identified as influencing the impact of R&D projects are not equally important and can therefore be ranked in order of their potential for impact.

Limitations

1. With the limitations of time, the sample of respondents selected for this study may not have been representative, because project directors other than those stationed at the University of Illinois and the recipients of the project of those R&D projects could not be included.

2. Due to the limitations of time, resources and methodology, it was not possible to validate the criteria suggested for rating project proposals as STRONG, AVERAGE, or WEAK on different impact variables.

The method used in this study included: a) classification of vocational education projects into three categories - Research, Development and Research and Development. This classification was validated by using it in classifying a random sample of projects funded by DAVTE over the last three years, b) reviewing literature on impact and evaluation of education projects and scientific innovations with a view to describe characteristics of high and low impact, c) identifying variables that could assist in predicting and evaluating impact of research and

development projects in vocational education by taking a system's view, d) establishing rankings of the predictive and evaluative impact variables by using Q-sort technique, validating these rankings by working out Kendall's coefficient of concordance and determining weightings of the predictive impact variables using the modified Guilford normalized-rank method.

The remaining part of the report on this study is divided into chapters two to five: Chapter two describes the review of literature pertaining to the present study on "Predicting impact of 'research and development' projects in Vocational Education." Chapter three describes development of questionnaires and methods used for identifying, validating, rank ordering and assigning weights to impact variables for R&D projects. Results of the study pertaining to classification of projects, rank ordering and weighting of predictive impact variables of R&D projects are contained in chapter four. This chapter also includes suggestions regarding criteria for rating impact variables and a proposed impact rating scale for predicting impacts of R&D projects in vocational education. Chapter five contains conclusions, suggestions for further investigation and summary of the present study.

CHAPTER 2

Review of Literature

The review of literature on predicting and assessing impact of research and development projects in vocational and technical education is organized with a view to answer the following questions: What are the categories into which different educational projects can be classified? What is impact as related to education? What are the characteristics of high impact and low impact projects? How can impact be evaluated for R&D projects? How can impact be predicted for R&D projects?

Classification of Projects

Dick (1976) classified educational projects into three types—namely the projects that were targeted on: a) teacher outcomes, b) student outcomes and c) school wide or organizational outcomes. These projects shared many of the same problems and procedures in implementing their evaluation plans. However each type had its own unique characteristics (Dick, 1976). According to Battelle (1973), an innovative project can be classified as non-mission oriented research (NMOR), as mission oriented research (MOR) and c) as development and application research or a combination of all these. Non-mission research (NMOR) meant a research carried out with the purpose of acquiring new knowledge according to the structure of a subject or the interests of the scientist without concern for a mission or application, even though the project within which this research is carried

out might have been funded with possible applications in mind. Mission oriented research meant a research carried out for the purpose of acquiring new knowledge expected to be useful in some kind of application. Development or application research meant the process of design, improvement, testing and engineering in the course of bringing an innovation to fruition. McCaslin (1976) has classified vocational education projects into eight categories. These categories are: administration and planning, curriculum development, teacher education, career education, dissemination, evaluation, guidance - placement - follow-up and others. Miller and Miller (1974) in developing a taxonomy of intended impact, classified R&D projects according to the part of educational system they affected i.e., instructional, administrative and policy. All the classification schemes reviewed above except that suggested by Battelle will not prove useful in categorizing educational projects on the basis of distinct impact characteristics. In order to develop impact ratings, it would be essential to develop a scheme for classifying educational projects into categories that have a majority of common impact characteristics.

Definition of Impact

Dictionary meaning of the word impact is shocking effect - an effect resulting from a violent contact (Webster, 1977). In engineering, impact is understood as the changes - internal or external - in a body resulting from the sudden application of an external force. Applied to education, impact may mean changes in an educational system as a result of introducing some new policy, curriculum, administrative

system or any kind of innovation relating to teaching or learning. Dick (1976) considered impact evaluation to be synonymous with summative evaluation, which meant determination of the absolute and/or relative effectiveness of a product. Dick (1976) defined impact as a "measurable phenomenon", which occurs after the completion of a project and may have a positive or negative value. He considered process evaluation as important for evaluating impact of a project. Miller and Miller (1974) considered impact as consisting of two broad parameters - intended and actual. According to them actual impact of R&D projects is very difficult to assess because of the inter-effects of many activities and other projects which are being implemented at the same time. Intended impact which describes the intentions of the proposal writers and of those who have approved and funded the project can, on the other hand, provide much useful information (Miller & Miller, 1974). Travers (1973) defined the use of the term "impact" as referring to any of the several relations: causal relation, deductive relation, inductive relation between propositions and sometimes, relation of presupposition between propositions.

Characteristics of High and Low Impact Projects

Several studies conducted to evaluate impact of projects have identified the characteristics that distinguish a project of high impact from that of low impact. Battelle (1973) in reviewing eight technological innovations which had a high social impact and some

other innovative studies identified eight characteristics that were of great importance to the success of an innovation. These characteristics were: a) recognition of need for innovation prior to the availability of the technological means for satisfying the need, b) presence of an independent inventor, working on his own behalf in initiating the process, c) the presence of a technical entrepreneur who champions a scientific or technical activity, d) origination of external inventions that help in the development of the innovation, e) government financing of the innovations, f) informal transfer of knowledge, g) availability of additional supporting inventions beyond the initiating invention and h) unplanned confluence of technology. These characteristics were identified on the basis of their being observed and reported frequently in the innovative process of the studies reviewed. The COVERD study (1976) identified several factors responsible for low measured impact of vocational education R&D projects. These were: shifting priorities and attendant lack of continuity, geographic distribution of funds, lack of coordination, inadequate dissemination and utilization, failure to measure impact continuously, failure to touch real questions or clarify issues, little of research and more of development. The Rand study (1975) identified a number of characteristics that contributed to the high impact of vocational education R&D projects. These were: better planning, selection of middle-sized schools as sites for implementing projects, good performance of project directors, involvement of school personnel in project

planning, development of materials on work site and extensive staff development. Development Associates study (1975) listed inconsistency of performance activities with the program objectives and discontinuity of activities beyond the end of the project as factors contributing to low impact. The GAO study (1974) listed in their findings increased enrollment and increased opportunities for handicapped and disadvantaged as indicators of high impact. The study also reported factors such as inadequate evaluation, too compliant, limited and data-starved planning, non-consideration of training resources, inefficient utilization of available facilities and non-consideration of manpower requirements, affecting low impact of projects. The National Center for Research in Vocational Education (1979) suggested degree of interpersonal influence used in dissemination of product, credibility of the dissemination agent, time required for effects of product to become visible as some of the variables related to product impact. Cheney-Stern and Evans (1978) considered continuity of effort, goals, results, evaluation and impact specifications as important factors facilitating impact of R&D projects. McLean (1979) described involvement of practitioners, teachers, administrators from the very beginning of the project and attending to more fundamental issues of teaching and learning as important variables that could affect impact. McCaslin, et al. (1976) found some 19 characteristics that distinguished high impact projects from low impact projects. Some of these

characteristics not mentioned in the studies reviewed earlier are: use of objective data in evaluating projects, more orientation of the participants of the project about their role in the project, allowing change in the objectives of the projects during its implementation, use of Network techniques in planning, prior experience of R&D by the organization conducting the project, less turnover of the project staff, availability of better support services and use of fewer advisory committees.

Evaluating Impact of Projects

Assessing actual impact of a project in education is one of the most vexing problems in education. Stake et al. (1978) concluded that a significant part of impact can be only seen but not measured. CIRCE at the University of Illinois has employed case study methodology in recording evidence of impact. Evans et al. (1979) also employed case study methodology in the first phase of Project Impact on "Assessing Impact of Vocational Education Research." The COVERD study (1976) concluded that "impact of R&D has been measured most often in terms of user acceptance, defined as frequency of requests for information rather than frequency of implementation of findings and installation of products" (COVERD, 1976). Impact measures have been sometimes subjective, difficult to validate, superficial and have failed to consider the long-term consequences of vocational education programs in R&D. The Committee on Vocational Education Research and Development, however recognized that effects of R&D projects cannot be isolated

because "many social, psychological and economic factors can confound or weaken the impact of R&D" (COVERD, 1976). McCaslin et al. (1976) in carrying out an evaluative study of the Resource Development Unit of the Kentucky Bureau of Vocational Education identified 61 projects funded by the RDU between July 1, 1969 and June 30, 1975. Data gathered on each of these included: title, grantee or contractor, contact person and annual funding level. Next a classification system for categorizing RDU's funded projects was developed by using modified Q-sort technique and finally through consultations with the RDU staff. Fifty-six percent degree of agreement was found on classifying 52 of the 61 projects between the project directors or project staff members and CVE staff. The third major activity consisted of developing and administering two questionnaires. The first questionnaire was a "General Impact Assessment Questionnaire". It basically asked respondents to rate the impact of each category of RDU funded projects, assess the impact of associated technical services provided by the RDU and rate the degree to which the RDU had met its objectives. The second instrument called the "Project Questionnaire" was developed to assess perceptions of individuals who played major roles in the RDU funded projects. The instrument was designed to obtain "impact data related to project type and category; project duration; numbers and types of participants; evaluation activities; project goals; project planning; continued utilization of products or processes

developed during the project; project impact; dissemination activities and the effectiveness of the RDU in selecting, monitoring and disseminating information regarding such projects" (McCaslin et al., 1976). The draft of the questionnaires was reviewed by non-project CVE personnel, pilot tested with CVE staff members previously involved in vocational education projects in Kentucky and the University Human Subjects Review Committee. The general impact questionnaire was mailed to 532 vocational educators randomly selected and the Project Questionnaire mailed to 61 individuals named as project contact people by the RDU. Respondents were asked to rate the overall impact of each type of project on Kentucky vocational education in general and on their educational agency in particular. A five point rating scale with points defined as some negative impact, no impact, high positive impact, no opinion was used in both the questionnaires. The percentages reflecting respondent's perception of the impact of each of the categories of projects were computed. The perceived highest impact was found in the curriculum development projects. In this study, factors accounting for the differential impact of various vocational R&D projects in Kentucky were also identified. To do this, five projects each of high impact and low impact were selected out of 55 projects for which data were received on the Project Questionnaire from individual project contact persons. Identification of projects as of high impact and of low impact was

done by the CVE staff. Projects were rated to have high impact if they: 1) brought about positive changes in the knowledge, attitudes or behaviors of the target participants, 2) remained in operation after federal funding ceased, 3) were adopted by other groups or agencies when appropriate. CVE staff rated each of the 55 projects into high, low or medium impact category. Analysis of variance test of inter-rater reliability suggested by Winer (1971) was applied to these ratings. A corrected total inter-rater reliability of .81 was found. RDU staff members were also asked to rate the projects into high, low or medium categories on the basis of their own independent knowledge of them. A consensus between the CVE staff ratings and RDU staff ratings was then relied upon to select five high and five low impact projects. These ten projects were site visited and interviews of project directors (and/or key contact persons) organized around eight areas (project resources, project staff, organizational clients, project planning, project characteristics, project implementation, project participants and project's outcomes and evaluation). These areas were further broken down into specific project characteristics that helped differentiate between high and low impact. Questions based on these characteristics were developed and used during interview situations with project directors or administered as questionnaires to 57 other project participants. The responses were analyzed to give percentage differences between high and low impact projects in respect of the above characteristics.

For describing effectively the impact of a project, Dick (1976) considered it necessary to document and describe project activities as they were planned and implemented. Dick considered this information (process evaluation) not only valuable for determining the effectiveness of the project but also for making management decisions relative to procedural or program changes. Dick (1976) recommended alignment of impact evaluation design with the goals and objectives stated for the project and adoption of pretest-posttest experimental design for desirable impact evaluation of the project outcomes. Scriven (1974) has advocated the use of goal-free evaluation in addition to goal-directed evaluation. COVERD (1976), Rand (1975) and DOL/MR&D (1975) studies reviewed reports and literature, commissioned papers and made site visits to evaluate impact of vocational education R&D projects. Moore and Magisos (1977) reviewed the five studies (COVERD, 1976; Rand, 1975; Development Associates, 1975; GAO, 1974; DOL/MR&D, 1975) and recommended that impact evaluation should be timely, accurate, empirically based, comprehensive, well planned and "programmatic, linking several projects together, so that the summative evaluation is broadly based." Impact evaluation should be independent of the administering agency of the projects and obtain an unbiased judgement. The National Center for Vocational Education Research (1979) developed a chart indicating the changes to be observed or measured at various levels for evaluating vocational education R&D projects. This chart is reproduced in Figure 1. The Illinois Office of Education study on project impact (1979) suggested that both immediate and subsequent impact of a project should be measured.

Figure 1. Potential Indicators of Change*

TYPE OF IMPACT	Level of Impact: SEA/LEA	SCHOOL	STAFF	STUDENT	LOCAL COMMUNITY
Attitude/Policy	Changes in attitude toward females in administrative roles in voc ed	Changes in enrollment policies		Changes in attitude toward voc ed	Changes in community attitude toward voc ed
Knowledge/Skill	Changes in evaluation knowledge and skills		Changes in teachers	Changes in students' occupational competencies	Changes in parents' knowledge of voc ed job options for their children
Behavior/Practice	Changes in state plans	Discard of existing practices	Changes in teaching practices	Greater enrollments/ placements of females in non-trained occupational programs/jobs	Increased voting for school levies related to voc ed

*National Center for Vocational Education Research, 1979.

Predicting Impact of Projects

The three recent research studies related to the area of predicting impact of education R&D projects have been reviewed. Einhorn and Hogarth (1978) in a set of studies examined the confidence of the judges in their judgement. They noted that in most studies judgements were simply correlated with the criteria. Their thesis is that for understanding the judgemental ability better, it is essential to consider the judgement, the actions taken and the outcome feedback together. To apply this rationale to predicting impact would mean linking impact evaluation statements with predictive impact statements thereby using the evaluation data as a feedback to modify future judgements (Tittle et al., 1978).

Ory, Harris and Clark (1978) developed and field-tested a vocational education evaluation model for programs at the community college level. They considered six criteria as important characteristics for evaluating vocational education programs. These criteria were: program's relationship to job market profile, program's success in meeting vocational aspirations of clientele, program's success in terms of student support, program's cost-effectiveness and program's success in reaching handicapped and disadvantaged. Each of the criteria was further operationalized into a number of specific sub-criteria as shown in Figure 2. In order to assign weights to the six criteria, an advisory group of 163 state and local educators, legislators, college trustees and businessmen were

Figure 2. Evaluation Score Sheet
(Ory, Harris, Dunitt, and Clark, 1978, p.10)

Sub-Criteria	Sub-Criteria Wt.	Attainment Ratings (circle) Strong	Adequate	Weak	No Data			
Criterion I. Local Job Market Needs								
A	32	x 3	(2)	1	0	= 64	The occupational community's expressed need for graduates
B	23	x (3)	2	1	0	= 69	Program graduates' need for employment (% finding jobs)
C	23	x 3	(2)	1	0	= 46	The occupational community's expressed need for the type of education offered by the program
D	11	x 3	(2)	1	0	= 22	Projected employment needs reported by the N.C. Manpower Report
Total 229 X .30 = 68.7 Weighted Criterion 1 Score								
Criterion II. Past and Present Student Needs								
A	21	x (3)	2	1	0	= 63	Employed graduate satisfaction with the program's job preparation
B	19	x 3	(2)	1	0	= 38	Employed graduate satisfaction with the knowledge offered
C	17	x 3	(2)	1	0	= 34	Employed graduate satisfaction with the skills training offered
D	16	x (3)	2	1	0	= 48	Employed graduate ratings of the program's quality
E	10	x 3	(2)	1	0	= 20	Current student satisfaction with the skills training offered
F	9	x 3	(2)	1	0	= 18	Current student satisfaction with the knowledge offered
G	8	x (3)	2	1	0	= 24	Current student ratings of the program's quality
Total 245 X .25 = 61.7 Weighted Criterion 2 Score								
Criterion III. Graduate Job Performance								
A	42	x 3	(2)	1	0	= 84	Employer satisfaction with the graduate's overall performance
B	33	x 3	(2)	1	0	= 66	Employer ratings of the quality of the graduate's overall performance
C	13	x 3	(2)	1	0	= 26	Employer reports of spending less, equal or more time on entry training
D	17	x 3	(2)	1	0	= 34	Employer reports of saving, breaking even, or losing money on entry training
Total 200 X .24 = 49 Weighted Criterion 3 Score								
Criterion IV. Occupational Community Support								
A	28	x (3)	2	1	0	= 84	Employer (of graduates) willingness to hire another graduate
B	26	x (3)	2	1	0	= 78	Occupational Community willingness to hire program graduates
C	22	x 3	(2)	1	0	= 44	Employer (of graduates) ratings of program quality
D	14	x 3	(2)	1	0	= 28	Occupational Community ratings of program quality
E	10	x (3)	2	1	0	= 30	Occupational Community awareness of the program's existence
Total 214 X .08 = 21.1 Weighted Criterion 4 Score								
Criterion V. Cost Effectiveness								
A	54	x (3)	2	1	0	= 162	Cost per Credit Hours
B	46	x (3)	2	1	0	= 138	Cost per Contact Hours
Total 300 X .07 = 21 Weighted Criterion 5 Score								
Criterion VI. Success in Reaching Handicapped & Disadvantaged								
A	41	x (3)	2	1	0	= 123	Handicapped and disadvantaged student satisfaction with program
B	24	x 3	2	(1)	0	= 24	Availability of support services (i.e., tutoring, financial aid)
C	19	x 3	(2)	1	0	= 38	Facility construction and/or alternation to meet special needs
D	12	x 3	2	(1)	0	= 12	Evidence of program's recruitment efforts
Total 201 X .05 = 10.1 Weighted Criterion 6 Score								

asked to rate these six criteria. One-hundred useful responses were available from this survey. Each criterion statement was paired against every other statement (in the paired comparison procedure). These comparisons were used to assess weights of the criteria. The three criterion statements weighted most highly were: the program's relationship to the job market profile, the program's success in meeting vocational aspirations of clientele and the program's success in terms of student support. Each sub-criterion was also assigned a weight. For example in criterion 1 (the program's relationship to the job market profile), there are four sub-criteria: the occupational community's expressed need for graduates, program graduate's need for employment (% finding jobs), the occupational community's expressed need for the type of education offered by the program, and the projected employment needs reported by the Kansas City Manpower Report. These sub-criteria were assigned weights of 32, 29, 29 and 11 respectively. Vocational education programs were rated as strong (3), adequate (2), weak (1) or with no data (0) on each sub-criterion.

A weighted criterion score was obtained on each criterion by multiplying the score on each sub-criterion with its respective weight, summing up these sub-criterion weighted scores and finally multiplying this sum with the weight of the criterion. These weighted criterion scores for the six criterion statements were then summed up to give the aggregated criterion scores of the project. The programs compared

on the basis of these aggregated criterion scores provided indicators of the program's quality. Such indicators were intended to be useful in maintaining, modifying or terminating a vocational program.

The basis for the rating categories - strong, adequate and weak for each sub-criterion - was established by the project team in conjunction with the administrative decision makers. For example, for a program to be rated STRONG on sub-criterion - "Program graduates' success in finding employment", at least 90% of the graduates needed to be employed in training-related fields. At least 75% needed to be employed for a rating of ADEQUATE and below 75% the program received a rating of WEAK. The proficiency levels of 90%, 75% and below 75% used to rate a program as strong, adequate or weak on any particular sub-criterion was decided on the basis of the standards of quality desired by the individual college's administration. The model thus designed was field-tested by evaluating ten vocational programs of the Kansas City metropolitan community colleges. Over 16,000 questionnaires were sent to obtain data from different sources, including current students, graduates, stop-outs, local business persons, employers, and program chairpersons. In addition to this, evaluation check lists for facilities (to determine accessibility for the physically handicapped), a program chairperson's check list for level of program participation offered to handicapped and disadvantaged students and a cost-evaluation form to be used by

evaluation personnel were used. The ten programs evaluated had a range of total weighted criterion scores from 92 to 258. The maximum possible range of total weighted criterion scores was from 0 to 300. Of the ten programs field-tested, three averaged criterion ratings of STRONG, six averaged criterion ratings of ADEQUATE and one averaged criterion ratings of WEAK. Ory et al. reported that these ratings supported 1) subjective judgements of the administrative personnel who evaluated their projects prior to this evaluation and 2) information collected with the questionnaire.

Tittle et al. (1978) under the main project "Linking Decision Making With Evaluation", conducted a study on the validity and feasibility of impact ratings for use in funding and evaluation. In this study, the predictive impact statements were developed by the Institute for Research and Development in Occupational Education (IRDOE) in consultation with the staff of the Department of Occupational Education Supervision (DOES). A summary of these statements is given in Table 1. In order to study the validity and feasibility of the predictive impact statements, two questionnaires were developed on the basis of discussion between IRDOE and DOES. Questionnaire 1 was used for ranking and rating the predictive impact statements. Questionnaire 2 was used to determine feasibility of collecting data required for assessing predictive impact statements. In other words, it was used to "ascertain the data which are readily available to

TABLE 1 - Predictive Impact Statements - January 1978

Statements that received the highest ratings and rankings:

(A) Training objectives will be met with minimal cost per student.

(C) Students will be trained for occupations where jobs are available.

(D) Program will be replicable in other settings.

(E) V ational needs of special groups will be met.

(F) Students will be trained for occupations traditionally dominated by the opposite sex.

(G) Training will be provided to increase students' employment options.

(H) Students will learn career planning.

New statements that should be considered (parallel statements were ranked high among outcome statements):

(J) Students will be prepared to meet job requirements as specified by prospective employers. (e.g., employer's ratings of program performance objectives in terms of job requirements)

(K) Training will increase students' job satisfaction. (e.g., prospective students will rate course goals/curriculum in relation to being able to do their work well)

Statements that received low ratings and ranking and might be deleted.

(B) Large numbers of students will be trained.

(I) New program will serve students' interests (even though jobs are not available locally).

local education agencies (LEAs), data that could be collected given advance notice, and data that LEAs considered impossible to collect" (Tittle, 1978). The procedures used for developing the questionnaires included identifying data required for each impact statement, development of an index or single number as a basis for grouping or categorizing a project on a rating scale and reducing the data actually asked for in the questionnaire to a bare minimum. Drafts of the questionnaires were prepared by IRDOE and reviewed. A sample survey was conducted. In this survey, information pertaining to Questionnaire 1 was obtained from directors or project directors in BOCES (intermediate school districts), project directors from the five large cities in the state and individuals who are supervisors in DOES. The number of completed copies of the questionnaire used for analysis in respect of the above three categories of respondents were 38, 33 and 5 respectively. The data received on rank ordering of the 10 impact statements according to their importance was analyzed to obtain "overall rank based on the mean ranks given each statement by each of the three groups and the total group" (Tittle et al., 1978). The amount of agreement between raters in rank ordering different statements was computed for the DOES staff as well as for those (overall ranks) given by the three sets of judges: the BOCES, large city, and DOES staff. Respondents were also asked to rate the 10 impact statements according to their importance in predicting impact. "The ratings were originally given on a scale from one (low) to twenty (high)

and later transformed to standardized T-scores." Of the 10 statements, six received an overall rating above the mean (50) and the remaining four below the mean. The seven statements selected out of these 10 for the impact rating scale in the order of their priority were then assigned weights on the basis of rank ordering given by DOES supervisors. The scaled weights were approximated by giving whole numbers of 3, 2, 1.

Questionnaire 2 was used to determine the feasibility of collecting data in respect of each impact statement and also in developing a criteria for rating a project STRONG, AVERAGE or WEAK on each of the impact statements. The criteria for rating each impact statement were developed on the basis of the distribution of data received for each statement. Authors reported that there were moderate to severe limitations to the data received. They said that the use of questionnaires to collect the distribution data had an inherent limitation in terms of communication with the respondents and interpretation of the request for data.

Both the studies by Ory et al. and Tittle et al. as reviewed here have limited themselves to the impact ratings of an instructional program. They have only considered impact variables relating to a part of the effects of an instructional program on the vocational education system. Many important variables, such as project inputs, project planning processes, quality of project products, to mention a few, have not been considered as affecting the impact of projects.

The study reported herein differs from the above two studies to the extent that: a) a holistic view of studying impact of vocational education projects has been taken, thereby considering all the major variables that could influence the impact of a Voc Ed project, and b) a link has been established between evaluating and predicting impact of Voc Ed projects.

CHAPTER 3

Methodology

This impact study consisted of three major activities. These included: 1) the development of a classification scheme for categorizing vocational education projects funded by DAVTE, 2) the identification of "impact variables" for predicting and evaluating impact of a "Research and Development" category of vocational education projects, 3) the ranking of both predictive and evaluative impact variables for (R&D) projects in order to determine their order of importance as well as weightings, and 4) suggestions for fixing criteria for rating predictive impact statements and construction of an "Impact Rating Scale" for predicting probable impact of R&D projects.

In this chapter, the methodologies used for the first three major activities have been described.

Classification of Vocational Education Projects

It was presumed that all vocational education projects could be classified into three major categories for the purpose of studying their impact. These categories were: a) Research, b) Development, and c) Research and Development. The basis for this presumption was that the projects classified under any one of the above three categories seemed to have common impact characteristics. The definitions for these three categories of projects are stated in Appendix.

For checking validity of this classification the following procedure was used:

Sample. Ten projects were selected randomly out of all the projects awarded to the Department of Vocational and Technical Education, University of Illinois at Urbana, by DAVTE during the fiscal years 1977-79 for the purpose of examining their classification. Eight managers of DAVTE responsible for making funding decisions for vocational education projects and twenty-five project directors including their associates selected randomly from the Vocational and Technical Education department of the University of Illinois at Urbana formed the sample for examining classification of the above ten projects.

Instrumentation, Data Collection and Analysis

A questionnaire as given in Appendix 1 was developed to obtain responses regarding the classification of the ten selected projects. Copies of the abstracts for contractual agreement of these projects and list of definitions of the three categories of projects were enclosed with the questionnaire.

The questionnaires were mailed or handed over personally to DAVTE managers, project directors and their associates. Following the return of the questionnaires, the responses were analyzed for the overall percentage agreements of the total sample (project directors and their associates and DAVTE managers) in classifying each of the ten projects. The mean and standard deviation of the percentage agreement over all the ten projects were worked out for the total sample.

Identification of Impact Variables

Studies on evaluation and impact of education projects and scientific innovations were reviewed to identify factors and events that influenced the impact of projects. To give order to this mass of information as well as to identify some missing factors/links that might influence the impact of a project, a system's view was taken. The factors influencing impact, hereinafter called impact variables, were grouped under the components of an impact study system (i.e., inputs to the project, processes used in the making of the project, product of the project and its quality, effects of the project on the inputs, processes, outcomes and environment of the educational system for each of the three categories of projects). With this as the basis, the impact variables that could assist in the prediction and evaluation of R&D projects were identified. A discussion was held with the members of the "Project Impact" staff at the University of Illinois to obtain a consensus on these variables.

Ranking and Weighting of Impact Variables

It was assumed that the variables for prediction and evaluation of impact differed in their contribution towards impact of R&D projects. To rank these variables in order of their importance and assign weights to them, the following procedure was adopted:

Sample. The sample was the same as that used for the classification of projects. It thus consisted of eight managers of DAVTE engaged in decision making for funding projects and twenty-five project

directors and their associates (VOTEC staff) selected randomly from the faculty and research assistants of the Department of Vocational and Technical Education at the University of Illinois, Urbana. These faculty members and research assistants had been involved at one time or the other in conducting projects funded by DAVTE.

Instrumentation and Data Collection

Two questionnaires, Questionnaire 2 and 3, were developed to obtain data on ranking of "Predictive Impact Variables" and "Evaluative Impact Variables" for R&D projects respectively. These questionnaires are given in the Appendix. These questionnaires were mailed or handed over personally to the subjects in the sample. In Questionnaire 2, meant for rank ordering predictive impact variables (which numbered 15) the Q-sort technique was employed. The subjects were asked to rank order the 15 impact variables into nine piles. The number of variables to be sorted into each pile was given in the instructions for completing this questionnaire. Following the return of the questionnaires, the data were analyzed as follows.

Data Analysis

The overall rank based on the mean ranks given to each impact variable (predictive and evaluative) by each of the two groups (VOTEC staff and DAVTE managers) and the total group was worked out. Kendall's coefficient of concordance (W) was computed for the ranks given by DAVTE managers and the VOTEC staff both for predictive and evaluative impact variables. The degrees of agreement between the rankings given

by the two sets of judges: DAVTE managers and VOTEC staff in respect of both predictive and evaluative impact variables were tested, using X^2 test at a level of significance of .05. To assign weights to the predictive impact variables, Guilford's modified, normalized-rank method was used. In deriving these weights, the ranks given by the total sample were used. In the Guilford modified, normalized-rank method, the ranks (ordinal data) are transformed to the interval scale values. By doing this, meaningful comparisons could be made between mean ranks.

CHAPTER 4

Results

Classification of Projects

It was presumed that vocational education projects funded by DAVTE could be classified into three categories i.e., Research, Development and Research and Development. A total of 33 persons (DAVTE managers, Faculty members and Research assistants of the department of VOTEC at the University of Illinois, Urbana) were asked on "Questionnaire 1" to categorize ten of the randomly selected projects funded by DAVTE during the fiscal years 1977-79. Of the 33 questionnaires sent out, 24 were returned for a response rate of 73%. The data as received in respect of the classification of 10 projects are tabulated in Table 2. The table shows the percentage responses made in classifying each of the 10 projects into Research, Development and Research and Development by the total sample. For example, the project entitled "Consumer and Homemaking Education Program for Low-Income Families" was categorized as a Development project by 91%, as a Research project by 9% and as a Research and Development project by 0% of the total group. The "most agreeable category" of classification for this project was therefore "Development" with a percent response (degree of agreement) of 91%. Column (6) in Table 2 shows the percent response of the "most agreeable category" of classification for each of the 10 projects. Except for projects 4 and 5, where the degree of agreement on classification was low i.e., 50% and 54% respectively,

TABLE 2 - Percent Responses of Classifying Voc Ed Projects Into Categories Of Research(R), Development(D) and Research and Development(R&D)

Project Number	Title of the Project	Frequency of Responses			Total Responses	Percentage of Responses			Percent Response of the most agreeable category of classification
		R	D	R&D		R	D	R&D	
(1)	(2)		(3)		(4)		(5)		(6)
1	Consumer & Homemaking Education Program for Low-Income Families	2	20	-	22	9	91	-	91
2	Development of Community College Noncredit Adult and Vocational Education programs	2	4	18	24	8	17	75	75
3	Methods and Materials for Entrepreneurship Education (Phase II)	-	18	6	24	0	75	25	75
4	Standards for Agricultural Occupations Programs in Illinois Community Colleges & Metropolitan High Schools	1	12	11	24	4	50	46	50
5	Development and Field Testing of Curriculum Modules for Teaching Occupational Survival Skills (Phase IV)	1	10	13	24	4	41	54	54
6	Implementation of Systematic Planning for Comprehensive Programs of Guidance, Counseling, Placement and Follow-Through in Illinois (Phase II)	1	18	5	24	4	75	21	75
7	Improvement in Secondary Occupational Education Programs as Reflected Through On Site Evaluation Process	17	3	3	23	74	13	13	74
8	Demonstration and Research Pesticide Workshops and Teaching Materials for Agriculture & Community College Teachers	-	21	3	24	0	88	12	88
9	Inservice of the Occupational Survival Skills Project	-	19	4	23	0	83	17	83
10	Development of Procedures for Assessing the Impact of Vocational Education Research and Development on Vocational Education	21	-	3	24	88	0	12	88

Overall mean percentage of agreement over 8 projects - 81.1% s = 7.16% (Excluding projects at S.N. 4 and 5)

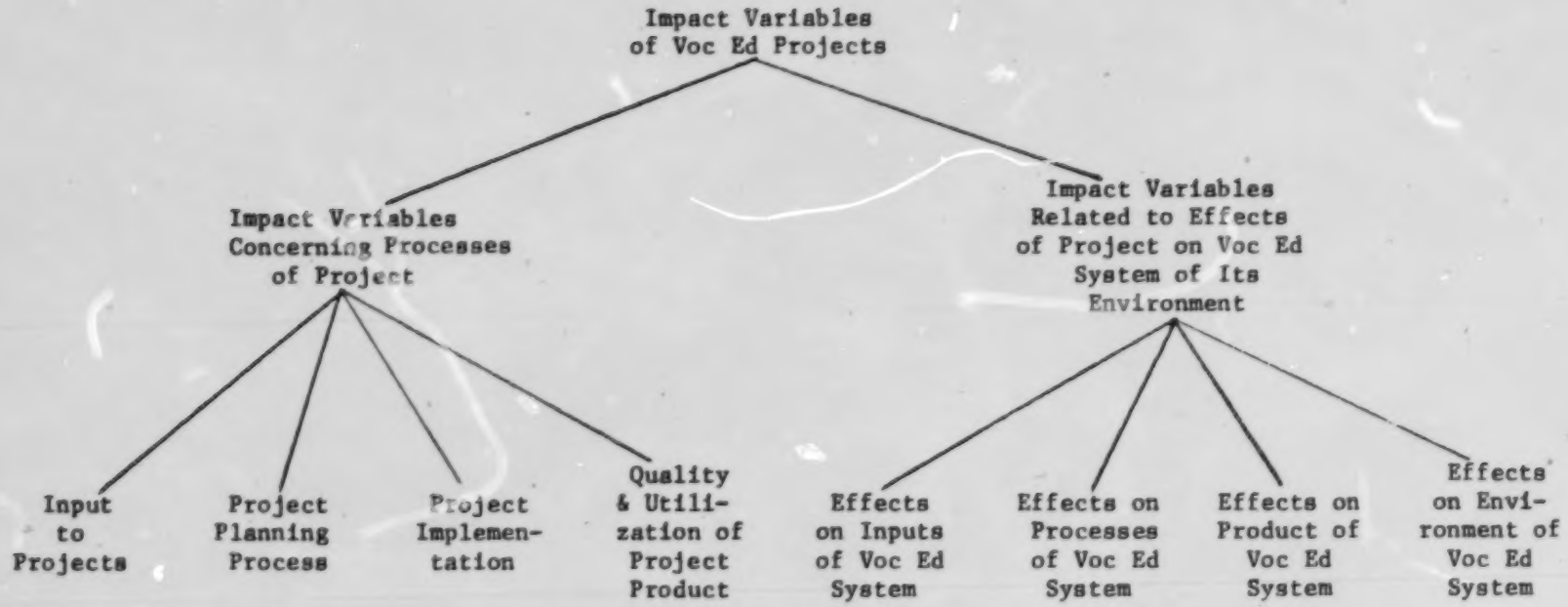
Overall mean percentage of agreement over 10 projects = 75.3% s = 13.84%

it was fairly high over the remaining eight projects (ranging from 74% to 91%). The reasons for low agreement on classifying projects 4 and 5 could have been due to the objectives of the project not being explicit in the abstract of one of the phases of the project and respondents understanding these objectives differently. The overall mean percentage of agreement for classification of these projects was 75.3% (s = 13.84%) and 81.1% (s = 7.16%) when projects 4 and 5 were excluded.

Identification of Impact Variables

Review of literature on the evaluation and impact of education projects and scientific innovations resulted in a long list of factors responsible for high or low impact of education projects. In order to give order to these data and find out certain missing factors that could possibly contribute to the impact of vocational education projects, a system's view was taken. The impact study of education projects was considered as a system and its components identified. These components are: inputs to the project, project planning processes, implementation of the project, quality and utilization of project product, effects of the project on the inputs, processes, product and environment of the vocational education system. These components of an "Impact Study System" correspond to two major sets of impact variables—one concerned with the processes of a project and its quality, and the other, effects of the project on vocational education system and its environment. This is shown diagrammatically in Figure 4. Though the components of impact study system

Figure 4. Impact Variables of Voc Ed Projects


Impact Variables of Voc Ed Projects
Impact Variables Concerning Processes of Project
Impact Variables Related to Effects of Project on Voc Ed System of Its Environment
Input to Projects
Project Planning Process
Project Implementation
Quality & Utilization of Project Product
Effects on Inputs of Voc Ed System
Effects on Processes of Voc Ed System
Effects on Product of Voc Ed System
Effects on Environment of Voc Ed System

would be the same for all categories of projects (i.e., Research, Development, and Research and Development), impact variables under each of the components might vary. Impact variables for "Research" and "Development" categories of vocational education projects were compiled and finalized after discussion with the staff of "Project Impact" at the University of Illinois, Urbana (1979). Tables 3 and 4 show the impact variables for "Research" and "Development" categories of vocational education projects respectively.

TABLE 3 - Impact Variables For Voc Ed Research Projects

A. Project Inputs

- Experience of the organization in Voc Ed research and its popularity.
- Quality of the project director (in management, dissemination and academic matters).
- Quality of the project staff (experience, qualifications and past contributions).
- Turnover of project staff
- Government financing of the project
- Availability of support services (library, reprography, secretarial, computational).
- Working relations with client organizations

B. Project Planning Processes

- Recognition and assessment of needs.
- Informal transfer of knowledge and coordination among members of the project team.
- Continuity (i.e., continuity in the nature of research topic, effort and results).
- Role orientation of project team members.
- Use of Network techniques (CPM/PERT) in planning.
- Establishing criteria for project evaluation and information system.

C. Project Implementation and Evaluation

- Dissemination of project findings and product.
- Performance of activities according to project goals.
- Ongoing evaluation of research outcomes.

TABLE 3 - (continued)

D. Project Product Quality and Its Utilization

- Importance of product as contribution to education practice.
- Relevance of product to the needs of vocational education.
- Feasibility for adoption
- Timeliness
- Creativity and forward thinking
- Product utilization
- Provides clarification of assumptions that guide policy considerations.
- Provides data for alternatives rather than a described or a defined solution to the problem.
- Changes intellectual perceptions
- Development of new analytical tool to issues and problems in vocational education.
- Amount of increased knowledge
- Percentage or number of targeted population affected

E. Effects on Inputs of Vocational Education System

- Funding policy for vocational education
- Enrollment policy
- Cost of training per student
- Cost of instructional staff, equipment and space

F. Effects on Educational System Processes

- Contribution to school organizational efficiency
- Contribution to classroom climate or operation
- Contribution to learning and teaching procedures
- Contribution to resources utilization and generation
- Contribution to information dissemination

TABLE 4 - Impact Variables for Voc Ed Development Projects

A. Project Inputs

- Experience of the organization and its popularity (in conducting development projects).
- Quality of the project director (in management, dissemination and academic matters).
- Quality of project staff (experience, qualifications and past contributions).
- Turnover of project staff
- Government financing of the project
- Availability of support services (library, reprography, secretarial).
- Working relations with client organization

B. Project Planning and Development Processes

- Recognition and assessment of needs.
- Involvement of practitioners and personnel from clientele organizations (teachers, school administrators) during project planning and development.
- Consideration of training resources
- Informal transfer of knowledge and coordination among members of project team.
- Role orientation of project team members
- Use of Network techniques (CPM/PERT) in planning.
- Establishing criteria for project evaluation and information system.

TABLE 4 - (continued)

C. Project Implementation and Evaluation

- Consistency of performance activities with program objectives.
- Follow-up of project activities after its completion.
- Manpower requirements for equipment, funds, space for implementation.
- Dissemination of project product
- Ongoing evaluation of project impact
- Development and demonstration of activities supported by research.

D. Project Product Quality and Its Utilization

- Relevance to the needs of targeted population
- Ease of implementation in respect of cost, skills, equipment required.
- Product quality
- Product utilization
- Product's service to high economic need
- Product's service to high proportion of handicapped students
- Replicability of product in other settings

E. Effects on Inputs of Vocational Education System

- Quality of course objectives and curriculum
- Cost of training per student
- Changes in the enrollment policy
- Changes in the teachers' quality
- Life expectancy of the equipment/skills proposed for purchase or development.
- Facilities for instructional program
- Cost of instructional staff, instructional materials and equipment.

TABLE 4 - (continued)

F. Effects on Educational System Processes

- Contribution to school organizational efficiency
- Contribution to classroom climate or operation
- Contribution to learning and teaching procedures
- Contribution to resources, utilization and generation
- Contribution to follow-up activities at the end of the project.

G. Effects on Products of Educational System

- Market demand of the program product
- Graduates of the program going for self-employment
- Amount of faculty development
- Graduates' performance on the job and cognitive gain scores
- Job options of the program product as compared to like programs.
- Increase in the trained student's job satisfaction
- Number of students trained
- Increase in student's interest to continue, education attitudes towards Voc Ed, perceptions, beliefs about self and others.

H. Effects on Educational System Environment

- Increase in the opportunities of continuing education to inservice workers that upgrade their competencies for increased productivity and promotability.
- Increase in the enrollment of women, handicapped and disadvantaged section of people.
- Changes in community attitude towards Voc Ed
- Changes in parents' knowledge of Voc Ed job options for their children.
- Increased voting of school levies related to Voc Ed

The impact variables for vocational education research and development project would be all those identified for the research as well as the development categories of projects in Tables 3 and 4.

Predictive and Evaluative Impact Variables for Research and Development Projects in Vocational Education

On the basis of Tables 3 and 4 predictive and evaluative impact variables for "Research and Development" projects in vocational education were identified. These are given in Tables 5 and 6 respectively. The assessment of these variables on the basis of the proposals submitted for a project would assist in predicting its probable impact and thus aid funding decision making. Evaluative impact variables when assessed for a completed project, would help in estimating the impact it had on the vocational educational system and its environment. Except for the impact variables which concern the quality of project inputs and the processes used during its planning and implementation, all the others are same for both predicting and evaluating impact of R&D projects. This commonality between the predictive and evaluative impact variables can help provide a link between evaluation and prediction of impact and thus aid in better decision making for future fundings.

TABLE - Predictive Impact Variables for Research and Development Projects in Vocational Education

1. Popularity enjoyed by the proposal-making organization and its experience in conducting R&D projects in Voc Ed.

2. Quality of Project Staff
   (i.e., Qualities of project director as a leader, manager, and disseminating agent, and the qualifications, experience and contributions to R&D in Voc Ed of the project staff.)

3. Availability of Support Services
   (i.e., library, reprography, secretarial, computational facilities and financial aid)

4. Working relations with client organization(s)

5. Quality of Project Planning
   (i.e., Recognition and assessment of needs, statement of project objectives in measureable terms, involvement of practitioners and personnel from client organizations in project planning and development, informal organizational climate, consideration of training resources, role allocation of team members, scheduling of project activities, formulation of ongoing evaluation and dissemination activities, continuity of efforts, goals, results, impact specifications and recognition of the implications of implementation.)

6. Quality of the Project Product and Its Utilization
   (i.e., its service to high economic need, ease of implementation, timeliness, creativity, forward thinking, replicability, service to high proportion of handicapped students, and contributions to changes in intellectual perceptions or development of new analytical tools in solving Voc Ed issues and problems.)

7. Effects of project (training program) on students' enrollment--number and quality of students.

8. Effects of project (training program) on meeting vocational needs of special groups.

9. Effects of project on improvement of teachers' quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities and cost of training per student.

TABLE 5 - (continued)

10. Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.

11. Market demand of the project product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.

12. Effects of the project (training program) on number of students trained.

13. Effects of the project on increasing opportunities of continuing education to inservice people.

14. Effects of the project on the enrollment of women, handicapped and disadvantaged section of people in Voc Ed.

15. Effects of the project on community's attitude towards Voc Ed and changes in parents' knowledge of Voc Ed job options for their children.

TABLE 6 - Evaluative Impact Variables for Research and Development Projects in Vocational Education

1. Quality of project product and its utilization (i.e., its service to high economic need, ease of implementation, timeliness, creativity, forward thinking, replicability, contributions to changes in intellectual perceptions or development of new analytic tools in solving issues and problems, applications and uses in other settings).

2. Effects of project (training program) on student enrollment number and quality of students.

3. Effects of project (training program) on meeting vocational needs of special groups.

4. Effects of project on improvement of teachers' quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities, and cost of training per student.

5. Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.

6. Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.

7. Effects of project (training program) on number of graduates trained.

8. Effects of project on providing opportunities of continuing education to inservice people to increase their productivity and chances of promotability.

9. Effects of project on the enrollment of women, handicapped and disadvantaged section of people in Voc Ed.

10. Effects of project on community's attitude towards Voc Ed and changes in parents' knowledge of Voc Ed job options for their children.

Ranking and Weighting of Impact Variables

Two groups, the first consisting of 21 project directors and their associates (VOTEC staff) from the University of Illinois at Urbana and the second consisting of three managers of the "Department of Adult, Vocational and Technical Education" (DAVTE managers) responded to Questionnaires 2 and 3. Questionnaires 2 and 3 were meant for collecting data regarding ranking of predictive and evaluative impact variables of R&D projects in vocational education respectively. Out of the 21 Questionnaire 2s received from the VOTEC staff, one was incomplete, therefore only 20 of these returned questionnaires were considered for analysis. In one of the Questionnaires 2 returned from the DAVTE managers, six impact variables were not ranked. However they were classified as of High, Medium and Low impact. For the purpose of analysis, the variables marked as High, Medium and Low impact were allotted rankings of 2, 5 and 8. The data on rank ordering of predictive and evaluative impact variables are given in Tables 7 and 8 respectively. The tables show rank ordering of the predictive and evaluative impact variables as perceived by the VOTEC staff, the DAVTE managers and the total group (OVERALL). These rankings were computed on the basis of the mean ranks given to each impact variable by each of the two groups and the total group.

Kendall's coefficient of concordance (W) was computed for the ranks given by the two groups of judges (VOTEC staff and DAVTE managers)

TABLE 7 - Rankings of Predictive Impact Variables of Voc Ed R&D Projects

S.N.	Predictive Impact Variable	Rankings		
		VOTEC STAFF	DAVTE MANAGERS	OVERALL
1	Popularity enjoyed by the proposal making organization and its experience in conducting R&D projects in Voc Ed.	13.5	12	14
2	Quality of project staff.	3	1.5	3
3	Availability of support services.	13.5	9	13
4	Working relations with client organizations.	8	12	8
5	Quality of project planning.	2	1.5	2
6	Quality of project product and its utilization.	1	3.5	1
7	Effects of project on students' enrollment - number and quality of students.	10	15	11
8	Effects of project on meeting vocational needs of special groups.	7	6	7
9	Effects of project on improvement of teacher's quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities and cost of training per student.	6	7.5	6
10	Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.	5	5	5
11	Market demand of program product, scope of self employment, of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.	4	3.5	4

TABLE 7 - (continued)

S.N.	Predictive Impact Variable	Rankings		
		VOTEC STAFF	DAVTE MANAGERS	OVERALL
12	Effects of project (training program) on number of graduates trained.	15	12	15
13	Effects of project on providing opportunities of continuing education to inservice people to increase their productivity and chances of promotability.	9	12	9
14	Effects of project on the enrollment of women, handicapped and disadvantaged section of people in Voc Ed.	11	7.5	10
15	Effects of project on community's attitude towards Voc Ed and changes in parents' knowledge of Voc Ed job options for their children.	12	12	12

$W = 0.91$ $\quad X^2_w (df = 14) = 24.15$ $\quad p < .05$

TABLE 8 - Rankings of Evaluative Impact Variables of Voc Ed R&D Projects

S.N.	Evaluative Impact Variables	Rankings		
		VOTEC STAFF	DAVTE MANAGERS	OVERALL
1	Effects of project on student enrollment number and quality of students.	6	5.5	6
2	Effect of project on meeting vocational needs of special groups.	5	4	5
3	Effects of project on improvement of teachers' quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities and cost of training per student.	4	3	4
4	Quality of project product and its utilization.	1	2	1
5	Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource generation and follow-up activities.	2	1	2
6	Market demand of program product, scope self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.	3	7	3
7	Effects of project (training program) on number of graduates trained.	10	8	10
8	Effects of project on providing opportunities of continuing education to inservice people to increase their productivity and chances of promotability.	7	9	7
9	Effects of project on the enrollment of women, handicapped and disadvantaged section of people in Voc Ed.	8	5.5	8
10	Effects of project on community's attitude towards Voc Ed and changes in parents' knowledge of Voc Ed job options for their children.	9	10	9

$W = 0.89$ $\quad X^2_w$ (df = 9) = 17.1 $\quad p < .05$

for the "Predictive" as well as "Evaluative" impact variables. The value of "W" was found to be 0.91 (X^2 = 24.75 $p < .05$) for "Predictive" impact variables and "W" = 0.89 (X^2 = 17.1 $p < .05$) for the "Evaluative" impact variables. The high values of "W" indicate a strong degree of agreement between the two groups in ranking both the predictive and evaluative impact variables.

This is so because a "mere statistical significance may not be as curcial as the knowledge that W is fairly high" (McNemar, 1969). The five highest predictive impact variables in the order of their importance were:

1. Quality of project product and its utilization
2. Quality of project planning
3. Quality of project staff
4. Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.
5. Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.

The five highest evaluative impact variables were:

1. Quality of project product and its utilization
2. Effects of project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.

3. Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.

4. Effects of project on improvement of teacher's quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities and cost of training per student.

5. Effects of project on meeting vocational needs of special groups.

There was a great similarity ($\gamma = 0.94$) between the overall order of importance given to the similar predictive and evaluative impact variables in Questionnaires 2 and 3 respectively. The strong agreement between the rankings of predictive and evaluative impact variables provides encouragement to seek and develop objective criteria or quantitative indicators for assessing these impact variables. In the section "Proposed Criteria for Rating Proposals of Research and Development Projects on Predictive Impact Variables" an attempt is made to initiate this effort by proposing a set of criteria which could be employed after due validation is assessing the worth or value of each predictive impact variable.

Weightings of Predictive Impact Variables

The weights of the fifteen "Predictive" impact variables were determined by using the method proposed by Guilford (1954). This provided another check for determining the order of importance of the variables. The weights were derived by using the rank ordering given by the total sample. The scaled weights were approximated by using whole number weights of 3, 2, 1. The computations for deriving these

weights are given in Table 9. Impact variable, "Effects of project on number of graduates trained" was dropped from being allotted a weight as it ranked the lowest and was not considered an important variable. Impact variable, "Effects of project on the enrollment of women, handicapped and disadvantaged section of Voc Ed" was also dropped, as it was reported by one of the respondents that it appeared the same as the variable, "Effects of project on meeting vocational needs of special groups." The impact variables that were judged most important (with scale values of 6.43, 6.22 and 6.17) were given weight "3". The next three impact variables (with scale values of 4.96, 5.65, and 5.74) were given a weight of "2". The remaining variables that were judged to have less importance (with scale values of 4.13, 4.22, 4.43, 4.61, 4.74, 4.78) were given a weight of "1".

Proposed Criteria for Rating Proposals of Research and Development Projects on Predictive Impact Variables

Predicting impact of a project will not only need knowledge regarding the various impact variables and their order of importance, but also an objective criteria for rating project proposals on each of them. Development of an objective criteria for rating would mean a) fixing and validating indices for rating a project proposal as STRONG, AVERAGE or WEAK on each impact variable, and b) checking the feasibility of collecting data for the indices. Once objective criteria are established for rating project proposals on each predictive impact variable, it would be possible to develop a "Predictive Impact Rating Scale."

TABLE 9 - Computation of Weights of Predictive Impact Variables

Ranks r_1	Rank Position R_1	Frequency of Ranks Received by Each Predictive Impact Variable															Σ	Area Under Curve "P"	Point on "C" Scale
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
1	9	2	5	0	0	2	7	0	1	0	2	3	1	0	0	0	23	94.45	8
2	8	0	4	0	3	5	2	0	1	2	2	3	0	1	1	0	24	83.34	7
3	7	1	5	1	0	8	9	0	4	1	6	5	1	1	4	0	46	72.23	6
4	6	2	4	1	4	4	2	5	1	6	4	4	1	3	1	2	44	61.12	6
5	5	3	1	5	5	3	1	7	7	6	6	3	4	7	4	6	68	50.00	5
6	4	2	3	4	3	1	1	4	2	3	2	3	3	3	3	9	45	38.89	4
7	3	4	1	8	5	0	0	3	3	2	0	1	4	5	6	1	43	27.78	4
8	2	4	0	4	1	0	1	1	2	2	0	0	3	2	3	5	28	16.67	3
9	1	5	0	0	2	0	0	3	2	1	1	1	6	1	1	1	24	5.56	2
	f_{i1}	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	Σ=345		
	f_{i1c}	95	143	97	109	142	148	102	110	114	130	132	89	106	104	95			
	$M_i=R_i$	4.13	6.22	4.22	4.74	6.17	6.43	4.43	4.78	4.96	5.65	5.74	3.87	4.61	4.52	4.13			

The "Predictive Impact Rating Scale" will aid in predicting probable impact of proposed projects and thus facilitate making funding decisions. This will also aid project directors in facilitating impact of their projects.

In this section, an attempt is made to suggest criteria for rating project proposals on each predictive impact variable. These proposed criteria are tentative and would need further validation as well as a feasibility study for data collection.

Proposed Criteria for Rating Predictive Impact Variables of Research and Development Projects in Vocational Education

Popularity Enjoyed by the Proposal Making Organization and Its Experience in Conducting R&D Projects in Voc Ed. Popularity of the proposal making organization may be judged as STRONG, AVERAGE or WEAK on the basis of the following:

- Experience of the organization in terms of the number of R&D projects completed during the last three years.
- Acceptability and utilization of the organizations's findings/ products during the last three years.
- Number of committees/commissions/advisory bodies represented by the organization in the field of vocational education during the last three years.
- Amount of funds made available to the organization for R&D work in Voc Ed.

Quality of Project Staff. The quality of the project staff may be rated as STRONG, AVERAGE or WEAK on the basis of the following:

- Project director's experience in terms of number of R&D projects completed during the last five years.

- Acceptability/utilization of the findings/products of the projects completed by the project directors.
- Number of committees/commissions/advisory bodies represented by the project director during the last three years.
- Percentage of staff turnover working under the project director during the last three years.
- Average experience in years of the project staff in research and development.
- Presence of an independent, inventive person on the project team.
- Average qualification of the project staff.

No specific indices for rating a project proposal (i.e., STRONG, AVERAGE or WEAK) on the above two impact variables have been suggested. The indices for rating will depend on the local conditions. However, the information received on the criterion factors suggested above for each impact variable may form the basis for rating.

Availability of Support Services. Data requested for rating a project proposal on this variable would be the checking of the following items:

- Some financial aid will be available from the government to conduct this project.
- The organization has adequate library facilities and access to other libraries for securing materials on loan.
- The organization has adequate reprographic facilities.
- The organization has adequate computational facilities.
- The organization has adequate supporting staff for secretarial work.

The index for rating the proposal on this variable will depend on the number of items checked and is suggested as under:

Scale Category	No. of Items Checked
Strong	5
Average	⩾ 4 < 5
Weak	< 4

Working Relations with Client Organizations. For rating a project proposal on this variable, the applicants will be requested to check the items out of the following, which truely represent their status:

- Personnel from the vocational education schools and professionals from employing agencies are involved at all stages of planning, implementing and evaluating R&D projects.
- Schools offering vocational programs cooperate and provide data for planning and assessing R&D projects.
- Staff of the proposal making organizations often visit vocational education schools and are consulted on the schools' problems.
- Voc Ed schools show eagerness and provide facilities for conducting experiments/pilot studies in connection with R&D projects of the organization.
- Voc Ed schools have adopted most of the findings of the projects conducted earlier by the organization.
- Voc Ed schools are actively involved in the development and testing of materials that form the part of R&D projects.

The index of rating the project proposal on this variable is proposed as under:

Scale Category	No. of Items Checked
Strong	⩾ 5
Average	⩾ 4 < 5
Weak	< 4

Quality of Project Planning. The rating on this variable will be based on the number of items checked out of the following:

- Proposal contains an evidence of needs for the project.
- Project objectives are stated in measurable terms.
- Proposal contains performance activities consistent with the objectives of the project.
- Proposal specifies the methodologies to be used for carrying out each activity.
- Planning of the project involves participation of personnel from the client organizations.
- Project team members transfer knowledge informally among themselves.
- Project proposed is a continuation of earlier results/goals/efforts.
- Project activities are scheduled by using Network techniques.
- Resources required for conducting the project in terms of money, materials, equipment, outside expertise, etc., are worked out.
- Scheme for disseminating the findings/product of the project is given.
- A systematic plan for ongoing evaluation of the project is given.
- Implications of the implementation of project findings/product are given in terms of additional staff, faculty training, additional equipment, materials and space.

The index of rating will be as under:

Scale Category	No. of Items Checked
Strong	≥ 12
Average	$\geq 10 < 12$
Weak	< 10

Quality of Proposed Project Product and Its Utilization. The rating of the proposal on this variable may be judged on the number of items checked out of the following:

- The project serves an area of high economic need.
- Project serves a high proportion of handicapped students among the program students.
- Project will clarify assumptions that guide policy of vocational education.
- Project will provide changes in intellectual perceptions.
- Project will develop new analytical tools to explore issues and problems in vocational education.
- Project product will be creative and of forward thinking.
- The product of the project will be replicable in other situations.
- Project is timely and serves the immediate needs of vocational education.
- Implementation of the project product will be easy and does not require substantive additional funds, staff, equipment, space and faculty training.

The index of rating suggested is:

Scale Category	No. of Items Checked
Strong	≥ 8
Average	$\geq 6 < 8$
Weak	< 6

Effects of Project on Student Enrollment. The criteria of rating on this impact variable is suggested as the ratio between the maximum number of seats available and the expected number of students that would apply for admission to the program. The index of rating will be:

Scale Category	No. of Seats Available / No. of Expected Applicants
Strong	≥ 2
Average	$\geq 1 < 2$
Weak	< 1

Effects of Project (Training Program) on Meeting Vocational Needs of Special Group. The project proposal may be rated as STRONG, AVERAGE or WEAK on this variable by comparing it with similar programs in respect of the following:

- Meeting vocational needs and interests of special groups such as females and disadvantaged section of population.
- Providing equal opportunity for entry to vocational courses for females and males upon request.
- Provision of special support services or counseling for females, males and disadvantaged sections of people who enter a non-traditional occupational program.

Effects of Project on Improvement of Teacher's Quality, Cost of Instructional Staff, Cost and Life Expectancy of Equipment, Instructional Facilities and Cost of Training Per Student. The rating of the proposal on this variable may be judged as STRONG, AVERAGE or WEAK on the basis of the following factors:

- The project will improve the subject matter competency of the teachers.
- The project will improve the teaching skills of the teachers.
- The project will devise measures that will cut down the cost on instructional staff.
- The project will devise/select equipment for the program which is comparatively economical and more durable.
- The project will cut down the cost of training per student.

Effects of the Project on Teaching-Learning Procedures, Management Procedures, School Organizational Efficiency, Classroom Climate, Resource Generation and Follow-Up Activities. A project proposal on this variable may be judged as STRONG, AVERAGE or WEAK, depending upon the extent to which it affects the following:

- Increased interest and participation of students in the classroom, shop or laboratory.
- Increased achievement of students.
- Increased motivation of students in learning.
- Improvement in the attitude of students towards learning.
- Improvement in the self-learning of students.
- Improvement in the practical skills of the job acquired by students.
- Improvement in relations with the employing agencies.
- Improvement in the management procedures followed in the school.
- Improvement in the classroom climate.
- Improvement in the utilization of equipment, materials, space, library and other facilities in the institute.
- Improvement in the follow-up studies of the school product.

Market Demand of Program Product, Scope of Self-Employment of Trained Graduates, Their Performance On The Job, Number of Employment Options, Job Satisfaction, Attitudes Towards Voc Ed, Beliefs About Self and Others. The rating of the proposal on this variable will depend upon the number of items checked out of the following:

- The number of local jobs available will be greater than the number of students participating in the program.
- Program will increase self-employment of the trained graduates.

- Program will serve students' interests.
- More than 70% of the entry level skills required by the employers will be met by the training provided.
- Program will provide trained graduates for two or more employment options.
- Program will improve students' attitudes towards vocational education and work.

The index of rating is suggested as under:

Scale Category	No. of Items Checked
Strong	≥ 4
Average	$\geq 2 < 4$
Weak	< 2

Effects of Project on Providing Opportunities of Continuing Education to Professional Staff to Increase Their Productivity and Chances of Promotability. The project proposal on this variable will be rated as STRONG, AVERAGE or WEAK according to the effects the project will have on the following:

- Number of professional staff likely to get benefit out of the program.
- The extent to which the program meets the requirements for increasing productivity and promotability of professional staff.

Effects of the Project on Community's Attitude Towards Voc Ed and Changes in Parents' Knowledge of Voc Ed Job Options for Their Children. The proposal on this variable will be judged as STRONG, AVERAGE or WEAK depending on how it compares with similar programs in affecting community's attitudes towards Voc Ed.

Recommended Rating Scale for Predicting Impact of Research and Development Projects in Vocational Education

Figure 4 shows a rating scale suggested for predicting impact of R&D projects in vocational education. The scale contains thirteen statements of predictive variables that have been given the highest ranking. The weight for each statement is given in the scale. Any project proposal received for funding will be rated as Strong (3), Average (2), or Weak (1) on each statement. The criteria to be used for rating the proposal against each statement in the rating scale is given in the section "Proposed Criteria for Rating Proposals of R&D Projects on Predictive Impact Variables". The applicants will be requested to supply the information required for rating on each statement as contained in that section. The range of total scores on this scale could be from 22 to 66. A proposal judged as Weak (1) on all the thirteen items will obtain a total score of 22 and a proposal judged as Strong (3) on all the items will obtain a total score of 66. The total impact score obtained by any R&D project proposal on this scale will be given by the following expression:

$$\text{Total Impact Score} = \sum_{i=1,\,n} \gamma_i \, q_i$$

γ_i = Weight of an item "i" on the rating scale

q_i = Score obtained by the project proposal on item "i" (the score can range from 3 (Strong) to 1 (Weak))

i = Range of items on the scale (1 to n)

Figure 4. Predictive Impact Rating Scale for Research and Development Projects in Vocational Education

Item	Scale Category			Weight	Score on Scale x Weight
	STRONG	AVERAGE	WEAK		
1. Popularity enjoyed by the proposal making organization & its experience in Research & Development in Voc Ed	☐ 3	☐ 2	☐ 1	x 1	
2. Quality of Project staff	☐ 3	☐ 2	☐ 1	x 3	
3. Availability of support services	☐ 3	☐ 2	☐ 1	x 1	
4. Working relations with client organizations	☐ 3	☐ 2	☐ 1	x 1	
5. Quality of project planning	☐ 3	☐ 2	☐ 1	x 3	
6. Quality of proposed project product & its utilization	☐ 3	☐ 2	☐ 1	x 3	
7. Effects of project on student enrollment-number & quality of students	☐ 3	☐ 2	☐ 1	x 1	
8. Effects of project on meeting vocational needs of special groups	☐ 3	☐ 2	☐ 1	x 1	
9. Effects of project on improvement of teacher quality, cost of instructional staff, cost & life expectancy of equipment, instructional facilities & cost of training per student	☐ 3	☐ 2	☐ 1	x 2	

Figure 4. (continued)

Item	Scale Category			Weight	Score on Scale x Weight
	STRONG	AVER-AGE	WEAK		
10. Effects of project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation & follow-up activities	☐ 3	☐ 2	☐ 1	x 2	
11. Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self & others	☐ 3	☐ 2	☐ 1	x 2	
12. Effects of project on providing opportunities of continuing education to inservice people to increase their productivity & promotability	☐ 3	☐ 2	☐ 1	x 1	
13. Effects of project on community's attitude towards Voc Ed & changes in parents' knowledge of Voc Ed job options for their children	☐ 3	☐ 2	☐ 1	x 1	

CHAPTER 5

Summary and Implications For Further Research

Summary

In recent years, a great concern is being expressed by the agencies - be they public or private - regarding the impact of projects funded by them. In 1976, Congress passed the vocational education amendments (Public Law 94-482) making it mandatory for the applicant to demonstrate a reasonable probability that the contract would result in improved teaching techniques, or produce curriculum materials that would have a substantial utilization before it could be awarded. This resulted in a great interest being shown for research on assessing impact of educational projects. Funding agencies of projects are faced with the twin problems of selecting among the project proposals for funding, those proposals that would have relatively high impact on the quality of education and collecting evidence of impact made by the projects funded by them. Whereas a number of studies have been conducted in evaluating impact of R&D projects in vocational education, very little work has been done in predicting impact of Voc Ed R&D projects.

This study was aimed at identifying and validating variables and their order of importance in predicting and evaluating impact of R&D projects in vocational and technical education. Another purpose of this study was to suggest an "Impact Rating Scale" for predicting impact of R&D projects in Voc Ed.

It was assumed that the variables affecting the impact of Voc Ed projects were different for different types of projects. The first task was therefore to formulate a scheme of classification for Voc Ed projects. It was presumed that all vocational education projects could be classified into three major categories - Research, Development and Research and Development - for the purpose of studying their impact. This classification was validated by using it in classifying a random sample of ten projects funded by DAVTE over the last three years. The overall degree of agreement in classifying eight of the ten projects (excluding two for which degree of agreement was low, i.e., 50% and 54%) by different people in Voc Ed (DAVTE managers, project directors and their associates from the VOTEC Department of the University of Illinois at Urbana) was found to be fairly strong ($\bar{x}$ = 81.1%, s = 7.16%).

Impact variables for different categories of Voc Ed projects were identified by reviewing literature on the evaluation and impact of education projects and scientific innovations. To give order to these data and to find out missing factors or links that could possibly contribute to the impact of vocational education projects, a system's view was taken. The impact study of education projects was considered as a system. Two major sets of variables - one concerned with the processes of a project and its quality, and the other, effects of the project on the vocational education system and its environment - were identified for each category of projects. On the basis of this,

"Predictive" and "Evaluative" impact variables for research and development projects of Voc Ed were formulated and finalized after discussion with the staff of "Project Impact" at the University of Illinois, Urbana. Except for the impact variables which concerned the quality of project inputs and the processes used during its planning and implementation, all the others were the same for both predicting and evaluating impact of R&D projects.

The "Predictive" and "Evaluative" impact variables were rank ordered by two groups of people in the Voc Ed, DAVTE managers and the project directors and their associates (VOTEC staff) at the University of Illinois, Urbana. A high degree of agreement resulted between the two groups in rank ordering both predictive impact variables ($W = 0.91$ X^2 $(df = 14) = 24.75$ $p < 0.05$) and evaluative impact variables ($W = 0.89$ X^2 $(df = 9) = 17.1$ $p < 0.05$). The five highest predictive impact variables in order of their importance were:

1. Quality of project product and its utilization
2. Quality of project planning
3. Quality of project staff
4. Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.
5. Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.

The five highest evaluative impact variables in order of their importance were:

1. Quality of project product and its utilization

2. Effects of project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow-up activities.

3. Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.

4. Effects of project on improvement of teacher's quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities, and cost of training per student.

5. Effects of project on meeting vocational needs of special groups.

There was a great similarity ($r = 0.94$) between the overall order of importance given to similar predictive and evaluative impact variables. This provided encouragement for developing objective criteria for assessing these impact variables. Suggestions were made for rating project proposals on each of the predictive impact variables. These proposed criteria are tentative and would need further validation as well as a feasibility study for data collection in respect of them.

Weightings of the predictive impact variables were determined by using a modification of normalized-rank method suggested by Guilford. This provided another check for the rank ordering of the predictive impact variables. An "Impact Rating Scale" for predicting impact of

research and development projects in Voc Ed was proposed. This could be used by the funding agencies in predicting probable impact of project proposals for R&D projects in Voc Ed. This would help the funding agencies in making funding decisions as well as the project directors in facilitating impact of their projects.

Implications For Further Research

This study leads to a number of further steps to be taken to understand and develop models and strategies for predicting and evaluating impact of different categories of projects. Some of these steps are:

1. Identification, validation and rank ordering of predictive and evaluative impact variables for "Research" as well as "Development" projects in Voc Ed.

2. Validation and feasibility study for fixing objective criteria for rating project proposals on different predictive impact variables.

3. Formulation and comparative study of the methods for evaluating different categories of Voc Ed projects on each of the evaluative impact variables.

4. Effect of evaluation data available in respect of impact variables on predicting impact of proposed projects for making funding decisions.

The study also leads to testing a number of hypotheses. The more important of these hypotheses are:

1. A project of better quality i.e., serving the high economic need of the area, ease of implementation, timelines, and replicability will have a higher impact.

2. A project with better quality of planning will have a higher impact.

3. A project (training program) which trains graduates for self-employment, greater number of employment options and on the job performance will show higher impact.

4. A project served by a better quality of project team in terms of their R&D experience and past contributions will show higher impact.

5. Working relations of the project team and the client organization(s) affect the impact of a project.

REFERENCES

Battelle Memorial Institute. Science, technology, and innovation. Columbus, Ohio: Battelle, 1973.

Cheney-Stern, M. R., & Evans, R. N. Effects of continuity on the impact of national education research. Unpublished paper, University of Illinois at Urbana-Champaign, 1978.

Comptroller General of the United States. Report to the Congress: What is the role of federal assistance for vocational education? Washington, D.C.: Comptroller General of the United States, December 31, 1974. (GAO Report, ERIC Document Reproduction Service No. ED 105 132)

Development Associates, Inc. An evaluation of vocational exemplary projects: Part D Vocational Education Act Amendments of 1968. Washington, D.C.: Development Associates, Inc., March 1975. (ERIC Document Reproduction Service No. 109 475).

Dick, W. Evaluating programmatic impact in education. Teacher Corps Research Adaptation Framework. Norman, Okla.: University of Oklahoma, 1976. (ERIC Document Reproduction Service No. ED 132 135)

Einhorn, H. J., & Hogarth, R. M. Confidence in judgement: Persistence of the illusion of validity. Psychological Review, in press.

Evans, R. N., Cheney-Stern, M., Braun, K., Hicks, M., Hook, C., & Malhotra, M. M. Development of procedures for assessing the impact of vocational education research and development on vocational education (Project Impact). University of Illinois at Urbana-Champaign, March 1979.

Evans, R. N. Personal communication, June 1979.

Federal Register. Rules and regulations, Vocational Education, State Programs and Commissioners Discretionary Programs, October 3, 1977, 53822-53891.

Guilford, J. P. Psychometric methods (2nd ed.). New York: McGraw-Hill, 1954.

Hull, W. L. Information packet for consulting assignment, Memorandum. Columbus, Ohio: The National Center for Research in Vocational Education, The Ohio State University, January 1979.

McCage, R. D. The development of a comprehensive state capacity for program improvement. Occasional paper No. 34. Columbus, Ohio: The National Center for Research in Vocational Education, The Ohio State University, January 1978.

McCaslin, N. L., Adams, K. A., & Gross, C. J. An evaluation of the resource development unit of the Kentucky Bureau of Vocational Education. Final report. Columbus, Ohio: The Center for Vocational Education, The Ohio State University, July 1976. (ERIC Document Reproduction Service No. ED 134 700)

McLean, L. D. The desired demise of dissemination. Unpublished paper, Department of Measurement Evaluation and Computer Applications, The Ontario Institute for Studies in Education, 1978.

McNemar, Q. Psychological statistics (4th ed.). New York: John Wiley and Sons Inc., 1969.

Miller, R., & Miller, L. W. Impact of vocational education research at the federal and state levels, project baseline supplement report. Flagstaff, Ariz.: Northern Arizona University, October 1974. (ERIC Document Reproduction Service No. ED 099 687)

Moore, A. B., & Magisos, J. H. Evaluation of vocational education research and development. The Journal of Vocational Education Research, 1977 2(4), 1-11.

National Academy of Sciences. Knowledge and policy in manpower: A study of the manpower research and development program in the Department of Labor. Washington, D.C.: National Academy of Sciences, 1975. (DOL/MR&D Report, ERIC Document Reproduction Service No. ED 118 802)

National Academy of Sciences. Assessing vocational education research and development. Washington, D.C.: National Academy of Sciences, 1976. (ERIC Document Reproduction Service No. ED 128 654)

Ory, J. C., Harris, Z., Dueitt, S. B., & Clark, D. L. The development and field testing of a vocational education evaluation model. Paper presented at the annual meeting of the American Educational Research Association, Toronto, March 1978.

Pascal, A. H. Federal programs supporting educational change volume III, the process of change appendix D. Santa Monica, Calif.: The Rand Corporation, April 1975. (ERIC Document Reproduction Service No. ED 108 328)

Scriven, M. Evaluation perspectives and procedures. In W. J. Popham (Ed.), Evaluation in education. Berkeley, Calif.: McCutchan Publishing Co., 1974.

Stake, R. E. The case study method in social inquiry. Educational Researcher, 1978, 7(2), 5-8.

Tittle, C. U., Zibrin, M., & Green, M. A study of the validity and feasibility of impact ratings for use in funding and evaluation, Case 14-78. New York: Institute of Research and Development in Occupation Education, City University of New York, 1978.

Travers, M. W. (Ed.). Second handbook of research on teaching. Chicago: Rand McNally & Company, 1973.

Webster's New World Dictionary. Cleveland and New York: The World Publishing Company, 1977.

Winer, B. Statistical principles in experimental design (2nd ed.). New York: McGraw-Hill, 1971.

APPENDIX

College of Education
Department of Vocational
and Technical Education
OFFICE OF VOCATIONAL EDUCATION RESEARCH

345 Education Building
Urbana, Illinois 61801
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June 28, 1979

I am engaged in conducting a study on "Predicting Impact of Projects in Vocational and Technical Education." This study may help: 1) Classifying projects for the purpose of studying their impact, 2) Establish priorities of variables that could aid in predicting and evaluating impact of "Research and Development projects" and 3) Design impact ratings for predicting and evaluating impact of R&D projects.

In order to examine the classification of projects and priorities of the variables that can aid in predicting and evaluating the impact of an R&D project, three (3) questionnaires are enclosed. The first questionnaire asks for classification of ten (10) projects funded by DAVTE under three (3) categories - Research, Development, and Research and Development. Questionnaires 2 and 3 ask for your ranking of variables in order of their importance for predicting and evaluating the impact of a "Research and Development" project respectively.

Your thoughtful responses to the enclosed questionnaires will greatly assist in formulating an impact rating that would aid in making funding decisions. I shall feel grateful if you will kindly return these questionnaires, duly completed, at your earliest possible convenience.

Sincerely yours,

M. M. Malhotra
Research Fellow (UNESCO)

MMM/sn

Enclosures

QUESTIONNAIRE 1 - Classifying Vocational and Technical Education Projects.

Instructions for Classifying Projects:

It is assumed that all the vocational and technical education projects funded by the Department of Adult Vocational and Technical Education (DAVTE) can be classified under the categories of Research, Development, and Research and Development for the purpose of studying impact.

Listed below are the titles of ten projects funded by DAVTE. The abstracts of the proposals submitted for these projects are given in Appendix B.

Please classify these projects under the categories, Research, Development, and, Research and Development. In classifying these projects, please follow the following instructions:

i) Read the definitions of the three categories of projects (Research, Development, Research and Development) given in Appendix A.

ii) Read the Abstract of the first project proposal. On the basis of the definitions given in Appendix A, classify this project under Research (R), Development (D) or Research and Development (R&D) by crossing the appropriate square ☒ opposite the title of the project.

iii) Follow the same procedure in classifying the other nine projects.

	Title of the Project	Category		
		R	D	R&D
1.	Consumer and homemaking education program for low-income families	☐	☐	☐
2.	Development of community college Non-Credit Adult and Vocational Education Programs	☐	☐	☐
3.	Methods and Materials for Entrepreneurship Education (Phase II)	☐	☐	☐
4.	Stnadards for Agricultural Occupations Programs in Illinois Community Colleges and Metropolitan High Schools	☐	☐	☐
5.	Development and Field-Testing of Curriculum Modules for Teaching Occupational Survival Skills (Phase IV)	☐	☐	☐

		R	D	R&D
6.	Implementation of Systematic Planning for comprehensive programs of Guidance, Counseling, placement and Follow-Through in Illinois (Phase II)	☐	☐	☐
7.	Improvement in Secondary Occupational Education Programs as Reflected Through as On Site Evaluation Process	☐	☐	☐
8.	Demonstration and Research Pesticide Workshops and Teaching Materials for Agriculture and Community College Teachers	☐	☐	☐
9.	Inservice of the Occupational Survival Skills Project	☐	☐	☐
10.	Development of Procedures for Assessing the Impact of Vocational Education Research and Development on Vocational Education	☐	☐	☐

Classification of Projects

Research Project

A project will be classified as a "Research Project" when it has either of the following purposes: a) to acquire new knowledge according to the conceptual structure of a discipline or the interests of the scholar without any concern for its direct application in Vocational Education problems e.g., determining relationship of self concept and human behavior. b) to acquire new knowledge that can be applied readily to solve some problem, e.g., developing an instrument for evaluating the performance of a product.

Development Project

A project will be classified as a "Development Project" when its purpose is to design, develop, train or test some product or process. It involves application of principles and techniques that are already known. For example development of teacher's manuals, textbooks, instructional modules, training of teachers for better performance, development of curriculum for a program are all development projects.

Research and Development Project

A project will be classified as a "Research and Development Project" when the purpose of the project is to acquire a new knowledge or develop a new technique, instrument or model and use it in designing, developing, testing or training some product or process. For example, developing instruments for evaluating instructional materials, using these instruments for evaluation and thus improve the instructional materials. Another example could be developing an instructional model and using it for designing instruction in a subject.

QUESTIONNAIRE 2: Ranking of Predictive Impact Variables of "Research and Development" Projects.

Instructions for Ranking:

Listed below are statements of impact variables that might influence the impact of "R&D" projects funded by DAVTE in vocational and technical education. Please rank these statements in order of their importance as factors to be considered in making funding decisions in a total of nine pile positions (ranks).

To facilitate ranking, 15 slips each bearing a statement of one of the impact variables are sent with this questionnaire. Establish nine piles representing relative order of importance (1 to 9) as shown in the figure.

MOST IMPORTANT								LEAST IMPORTANT
1	2	3	4	5	6	7	8	9
1	1	2	2	3	2	2	1	1

No. of statements

The slip to be placed in pile "1" bears the statement of impact variable, you feel is the Most Important. The slip to be placed in pile "9" bears the statement of the impact variable, you feel is the Least Important. Of the remaining slips, put one in pile "2" which you feel bears the second most important impact variable, put two in pile "3" which you feel are the third most important variables and so on. The number of slips to be placed in each of the nine piles are given in the diagram. After the sorting is over, write the pile position of each of the statement in the space at the right side of the statement in the questionnaire.

Predictive Impact Variable	Rank Order
• Popularity enjoyed by the proposal making organization and its experience in conducting R&D projects in Voc Ed.	_____
• Quality of Project Staff (i.e., quality of the project director as a leader, manager and disseminating agent plus the qualifications, experience and contributions to R&D, of the project staff).	_____

- Availability of support services (i.e., Library, reprography, secretarial, computational facilities and financial aid). _____

- Working relations with client organization(s). _____

- Quality of Project planning (i.e., recognition and assessment of needs, statement of project objectives in measurable terms, involvement of practitioners and personnel from client organizations in project planning, informal organizational climate, consideration of training resources, role allocation of team members, scheduling of project activities, formulation of ongoing evaluation and dissemination activities, continuity of efforts, goals results, impact specifications and recognition of the implications of implementation). _____

- Quality of the proposed project product and its utilization (i.e., its service to high economic need, ease of implementation, timeliness, creativity, forward thinking, replicability, contributions to changes in intellectual perceptions or development of new analytical tools in solving issues and problems, application and uses in other settings). _____

- Effects of project (training program) on student enrollment - number and quality of students. _____

- Effects of project (training program) on meeting vocational needs of special groups. _____

- Effects of project on improvement of teacher quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities and cost of training per student. _____

- Effects of the project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow up activities. _____

- Market demand of program product, scope self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others. _____

- Effects of project (training program) on number of graduates trained. _____

- Effects of project on providing opportunities of continuing education to inservice people to increase their productivity and chances of promotability. _____

- Effects of project on the enrollment of women, handicapped and disadvantaged section of people in Voc Ed. _____

- Effects of project on community's attitude towards Voc Ed and changes in parents' knowledge of Voc Ed job options for their children. _____

Please add any impact variables that you feel are important and should be included. However, do not rank them with others:

_____

_____

_____

QUESTIONNAIRE 3: Ranking of Evaluative Impact Variables for "Research and Development" Projects.

Instructions for Ranking:

Listed below are statements of variables that determine the impact of a "Research and Development" project in Vocational and Technical Education. Please rank these statements in the order of their importance as project outcomes.

Write a "1" in the space at the right side of the statement you feel is the most important outcome, a "2" opposite the second most important statement, etc., until all 10 statements have been ranked. The least important statement of impact of a project will be ranked "10".

Evaluative Impact Variables	Rank Order
• Effects of the project (training program) on student enrollment number and quality of students.	_____
• Effects of project (training program) on meeting vocational needs of special groups.	_____
• Effects of project on improvement of teacher's quality, cost of instructional staff, cost and life expectancy of equipment, instructional facilities, and cost of training per student.	_____
• Quality of the project product and its utilization (i.e., it service to high economic need, ease of implementation, timeliness, creativity, forward thinking, replicability, contributions to changes in intellectual perceptions or development of new analytic tools in solving issues and problems, applications and uses in other settings.)	_____
• Effects of project on teaching-learning procedures, management procedures, school organizational efficiency, classroom climate, resource utilization, resource generation and follow up activities.	_____
• Market demand of program product, scope of self-employment of trained graduates, their performance on the job, number of employment options, job satisfaction, attitudes towards Voc Ed, beliefs about self and others.	_____

- Effects of project (training program) on number of graduates trained. _____

- Effects of project on providing opportunities of continuing education to inservice people to increase their productivity and chances of promotability. _____

- Effects of project on the enrollment of women, handicapped and disadvantaged section of people in Voc Ed. _____

- Effects of project on community's attitude toward Voc Ed and changes in parent knowledge in Voc Ed job options for their children. _____

Please add any outcome variables you feel are important and should be included, but do not rank them with the others.

_____

_____

_____